

Application No. 09/923,569
Amendment dated November 30, 2004
Reply to Office Action dated October 6, 2004

Docket No. 1232-4750

Amendments to the Claims:

Claims 1-4, 7-26, 36 and 37 are pending in this application.

This listing of claims will replace all prior versions, and listings, of claims in the application:

1 (CURRENTLY AMENDED): An image display apparatus comprising:

a first image modulation means;

a second image modulation means;

a color combining optical system which combines a light of a first wavelength area emitted from said first image modulation means and a light of a second wavelength area emitted from said second image modulation means;

a first lens having positive power arranged between said first image modulation means and said color combining optical system; and

a second lens having positive power arranged between said second image modulation means and said color combining optical system;

said color combining optical system including :

~~an color combining prism consisting of a plurality~~ a plurality of prisms cemented to one another; and

a dichroic film which combines the light of ~~said~~ said first wavelength area and the light of said second wavelength area by reflecting the light of said first wavelength area and transmitting the light of said second wavelength area;

wherein an optical thickness of said dichroic film increases to other end from the end along slant direction to incident optical axis of the light of said first wavelength area, and

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wherein said dichroic film is formed on interfaces between two prisms in a plurality of prisms.

2 (PREVIOUSLY PRESENTED): An apparatus according to claim 1, wherein a thickness of the dichroic film increases or decreases from one end side to the other end side in the inclining direction.

3 (PREVIOUSLY PRESENTED): An apparatus according to claim 1, wherein a refractive index of the dichroic film increases or decreases from one end side to the other end side in the inclining direction.

4 (PREVIOUSLY PRESENTED): An apparatus according to claim 1, wherein an optical thickness of said dichroic film increases as an incident angle of the light of said first wavelength area on the dichroic film increases.

5-6 (CANCELLED):

7 (PREVIOUSLY PRESENTED): An apparatus according to claim 1, wherein said first lens and said second lens are contacted to said color combining prism.

8 (PREVIOUSLY PRESENTED): An apparatus according to claim 1, wherein said first lens and said second lens are integrally formed in said color combining prism.

9 (PREVIOUSLY PRESENTED): An apparatus according to claim 1, wherein said color combining prism incorporates two dichroic films for reflecting different color light beams, and

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an optical thickness of at least one of the two dichroic films increases or decreases from one end side to the other end side in the inclining direction.

10 (PREVIOUSLY PRESENTED): An apparatus according to claim 9, wherein the two dichroic films are formed so as not to cross each other within said color combining prism.

11 (PREVIOUSLY PRESENTED): An apparatus according to claim 9, wherein said color combining prism comprises three prisms.

12 (PREVIOUSLY PRESENTED): An apparatus according to claim 9, wherein said color combining prism comprises four prisms.

13 (PREVIOUSLY PRESENTED): An apparatus according to claim 12, wherein two prisms are arranged between two dichroic films.

14 (PREVIOUSLY PRESENTED): An apparatus according to claim 1, wherein said color combining prism includes a plurality of prisms, and

a prism, of the plurality of prisms, which is located nearest to an exit side has at least three optically flat surfaces, and an exit surface also serves as a totally reflecting surface.

15 (PREVIOUSLY PRESENTED): An apparatus according to claim 1, wherein said color combining prism sequentially includes, from an exit side,

a first prism having at least three optically flat surfaces, with an exit surface also serving as a totally reflecting surface,

a second prism having at least three optically smooth surfaces, and

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a third prism having at least two optically smooth surfaces, and
two dichroic films which reflect different color light beams are arranged between
said respective prisms so as not to cross each other.

16 (PREVIOUSLY PRESENTED): An apparatus according to claim 1, wherein said color
combining prism sequentially includes, from an exit side,

a first prism having at least three optically flat surfaces, with an exit surface also
serving as a totally reflecting surface,
a second prism having at least two optically smooth surfaces,
a third prism having at least three optically smooth surfaces, and
a fourth prism having at least two optically smooth surfaces,
two dichroic films which reflect different color light beams are arranged between
said first and second prisms and between said third and fourth prisms so as not to cross each
other.

17 (PREVIOUSLY PRESENTED): Aa apparatus according to claim 1, wherein $0.07 < L/f < 0.35$ is satisfied, where L is a diagonal length of an image display portion of said image modulation means, and f is a focal length of said positive refracting optical element.

18 (PREVIOUSLY PRESENTED): An apparatus according to claim 9, wherein an angle q_1 defined by a surface of said color combining prism which is located on an exit side and on which a dichroic film is formed and an exit surface of said color combining prism satisfies

$$20^\circ < q_1 < 35^\circ$$

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19 (PREVIOUSLY PRESENTED): An apparatus according to claim 9, wherein an angle q_2 defined by an exit surface of said color combining prism and a surface of said color combining prism which is located on an incident side and on which a dichroic film is formed satisfies

$$40^\circ < q_2 < 50^\circ$$

20 (PREVIOUSLY PRESENTED): An apparatus according to claim 1, wherein a focal length of at least one of said plurality of positive refracting optical elements is different from focal lengths of said remaining positive refracting optical elements.

21 (PREVIOUSLY PRESENTED): An apparatus according to claim 1, further comprising a projection optical system for enlarging/projecting combined image light from said color combining optical system.

22 (PREVIOUSLY PRESENTED): An apparatus according to claim 21, wherein $|L_{in}/L| > 4$ is satisfied, where L_{in} is a distance from an incident pupil of said entire overall image projection optical system including said projection optical system, said color combining prism, and said positive refracting optical element to a display portion of said image modulation means, and L is a diagonal length of the image display portion of said image modulation means.

23-24 (CANCELLED):

25 (PREVIOUSLY PRESENTED): A system according to claim 10, wherein said color combining prism comprises three prisms.

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26 (PREVIOUSLY PRESENTED): A system according to claim 10, wherein said color combining prism comprises four prisms.

27 (WITHDRAWN): A dichroic prism comprising:

a plurality of prisms cemented to one another; and

a plurality of dichroic films,

wherein a thickness of at least one of said plurality of dichroic films changes along a surface on which said at least one dichroic film is formed.

28 (WITHDRAWN): A dichroic prism according to claim 27, wherein said plurality of dichroic films do not intersect one another in said dichroic prism.

29 (WITHDRAWN): A dichroic prism according to claim 27, wherein a thickness of each of said plurality of dichroic films changes in a surface on which the dichroic film is formed.

30 (WITHDRAWN): An image display apparatus comprising:

a plurality of image display elements;

a dichroic prism defined in claim 27; and

a projection optical system for projecting light that was emitted from a light source and through said plurality of image display elements and said dichroic prism on a surface to be projected.

31 (WITHDRAWN): An image display apparatus comprising:

a plurality of image display elements; and

a dichroic prism defined in claim 27 for combining color lights from said plurality

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of image display elements.

32 (WITHDRAWN): An image display apparatus according to claim 31, wherein an angle θ_1 defined by the dichroic film, of said plurality of dichroic films, which is located on an exit side and an exit surface of said dichroic prism satisfies

$$20^\circ < \theta_1 < 35^\circ.$$

33 (WITHDRAWN): An image display apparatus according to claim 31, wherein an angle θ_2 defined by the dichroic film, of said plurality of dichroic films, which is located on an incident side and an exit surface of said dichroic prism satisfies

$$40^\circ < \theta_2 < 50^\circ.$$

34 (WITHDRAWN): An image display apparatus according to claim 31 further comprising a plurality of lenses between said plurality of image display elements and said dichroic prism.

35 (WITHDRAWN): An image display apparatus according to claim 31, wherein the number of said plurality of image display element is three, and three positive lenses are provided such that each positive lens is located between the corresponding image display element and said dichroic prism.

36 (CURRENTLY AMENDED): An image display apparatus comprising:

a first image modulation means;

a second image modulation means;

a color combining optical system which combines a light of a first wavelength

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area emitted from said first image modulation means and a light of a second wavelength area emitted from said second image modulation means;

a first lens having positive power arranged between said first image modulation means and said color combining optical system; and

a second lens having positive power arranged between said second image modulation means and said color combining optical system;

said color combining optical system including:

~~a color combining prism consisting of~~ a plurality of prisms cemented to one another; and

a color combining film which combines the light of said first wavelength area and ~~the light~~ the light of said second wavelength area by reflecting the light of said first wavelength area and transmitting the light of said second wavelength area;

wherein an optical characteristic of said color combining film changes to other end from the end along slant direction to incident optical axis of the light of said first wavelength area and

wherein said color combining film is formed on interfaces between two prisms in a plurality of prisms.

37 (PREVIOUSLY PRESENTED): An apparatus according to claim 36, wherein an optical thickness of said color combining film increases to other end from the end along slant direction to incident optical axis of the light of said first wavelength area.